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WOODCOCK STATUS REPORT

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UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
Special Scientific Report — Wildlife No. 140

UNITED STATES DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife

WOODCOCK STATUS REPORT, 1970

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Division of Wildlife Research
Laurel, Maryland



Bureau of Sport Fisheries and Wildlife
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ABSTRACT

Information on the current status and population trends of the American woodcock is provided by annual singing-ground surveys over much of the species' breeding range and by wing-collection surveys in the eastern United States. The 1970 singing-ground survey showed no change in the breeding population index for the Eastern Region, a 3.12 percent increase for the Western Region, and a 2.11 percent increase rangewide. This index is based on 752 comparable survey routes, all randomly selected, 35 percent more than the 568 routes used in 1969.

The wing-collection survey for the 1969-70 season suggested a decline of 7.03 percent in productivity the previous summer, a slight decline in the average daily bag per hunter, and a sharper drop of 11.1 percent in the average seasonal bag. There is evidence that the woodcock harvest and the number of hunters participating increased over previous years, with the 1969-70 harvest exceeding 1.1 million birds. Woodcock research is increasing, with the present emphasis directed to banding on breeding grounds.

THE STATUS OF AMERICAN WOODCOCK - 1970

INTRODUCTION

This report presents data on the American woodcock (Philohela minor) obtained from the singing-ground survey conducted during the spring of 1970, the wing-collection survey conducted during the previous hunting season, and additional information which has accumulated since publication of the last woodcock status report (Clark, 1970).

The woodcock is increasing in popularity as a game bird. Although interest in the species is still greatest in northern States and adjacent Canadian Provinces, more U. S. hunters in the central latitudes and the South are turning to woodcock. Except in the Northeast, most woodcock were formerly taken incidentally to hunting grouse or quail. Now more hunters seek woodcock as a primary game species. Factors contributing to this change include:

1. Greater recognition of the woodcock's sporting qualities.
2. Expansion of bird-dog ownership and greater hunter mobility.
3. A gradual increase in daily bag limit and season length in recent years.

Members of the rapidly increasing fraternity of birdwatchers also are becoming more cognizant of woodcock. Thus, the status of the bird is growing in our recreation-conscious society.

Most game managers and researchers have given far less attention to woodcock than to waterfowl and resident game bird species. Although woodcock research and management activities are increasing at both Federal and State-Provincial levels, there are many missing links in the chain of knowledge necessary to understand this species and its potential for supplying outdoor recreation.

SINGING-GROUND SURVEY

Procedures

The singing-ground survey, which enumerates singing males heard along predetermined routes, is used as an index to the size of the breeding population. It is hoped that through the analysis of these survey data and of intensive research data on the breeding grounds we shall become more knowledgeable in relating singing-ground survey results to actual breeding populations. At present, the index is our sole measure of the woodcock breeding population.

Between 1964 and 1970 the survey underwent a transition from routes selectively located in woodcock habitat of average or better than average

quality (management routes) to randomly located routes covering habitat of all levels of quality (Clark, 1970). Because the conversion from management routes to random routes was 90 percent completed in 1969, the 1970 survey provided comparable random sample data for 2 consecutive years from most of the woodcock's breeding range: 95 percent of the 1,060 routes checked in 1970 were randomly selected (table 1). Thus, for the first time since the surveys began, comparable breeding population indexes for the breeding range of the woodcock were based entirely upon random routes. In four States where both management and random routes were surveyed, results from the two types could not be combined. In two States where only a few management routes were surveyed, there were insufficient data for inclusion in this report.

The 1970 indexes are based on 752 comparable routes, 35 percent more than the previous high of 568 in 1969. Thus, the breeding range was more intensively sampled this year than ever before. In computing the indexes, data from each State were weighted according to the State's proportion of the total land area (inland water area excluded) in the region or the range of the species (table 2).

Some routes had no occupied singing grounds on any of the 10 stops. When a route shows "0" results for 2 consecutive years under comparable circumstances, it is placed on the "Constant 0" list. These routes are included in the number of comparable routes, but are not field-checked annually; they will be checked at 5-year intervals to determine if woodcock are present.

Because the group of routes paired with comparable routes the preceding year to determine the percent change is not necessarily the same group paired with comparable routes the subsequent year, it is not logical to depict graphically the actual number of birds heard per route. Also, the conversion to random routes, which usually averaged fewer birds, precludes portraying the annual average number of birds per route. Therefore, the average number of woodcock heard per comparable route shown in figure 1 is calculated as follows:

1. Determine percent difference (in number of woodcock heard per comparable route) between the 1969 and the 1970 surveys.
2. Apply that percentage to the 1970 figure to obtain an adjusted figure (woodcock heard per comparable route) for 1969.
3. Apply the percent difference between 1968 and 1969 (as shown in the 1969 report) to the adjusted 1969 figure to obtain an adjusted figure for 1968.
4. Do the same for each year, working back to the beginning of the index period.

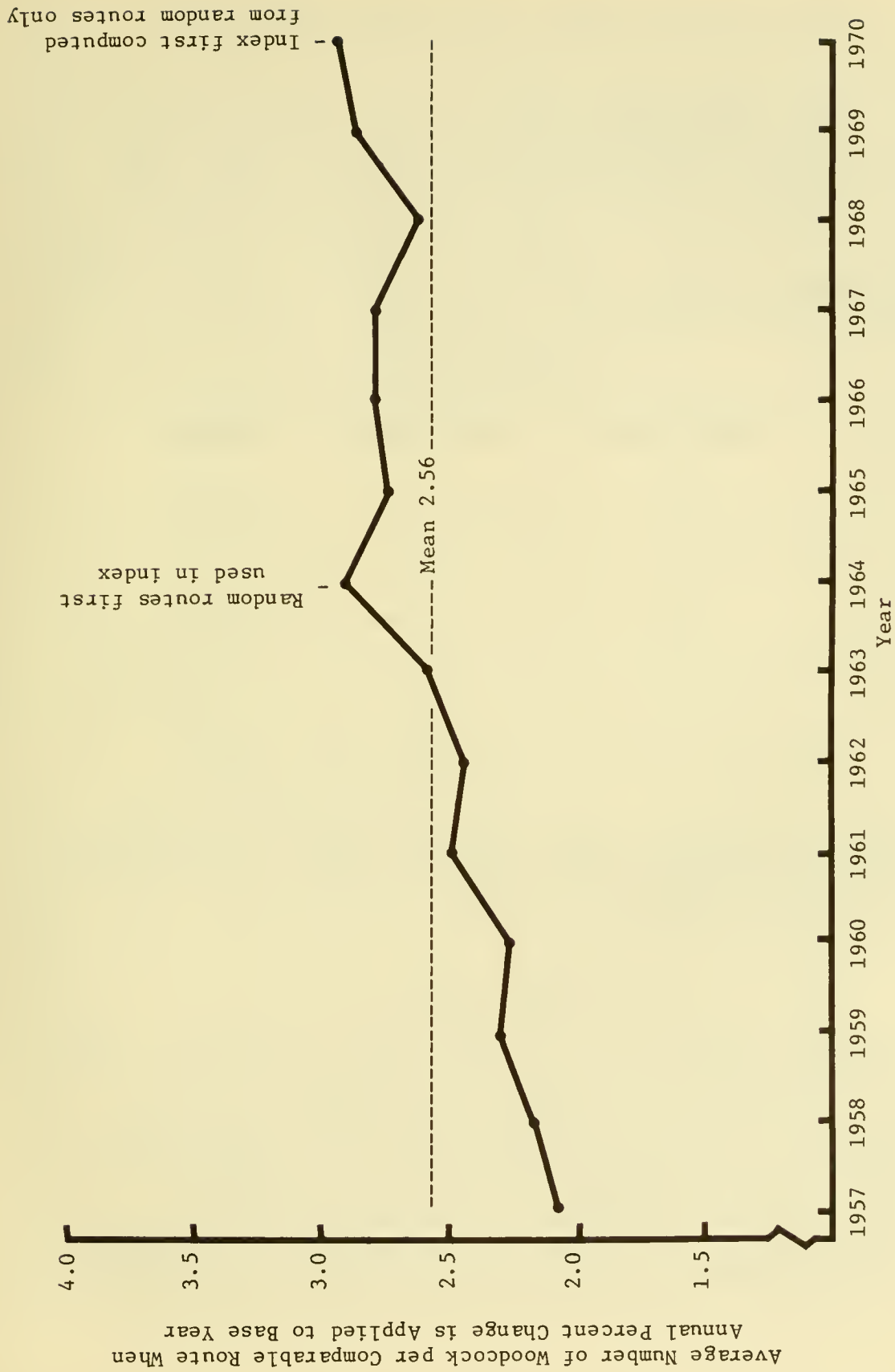


Figure 1.--Trends in singing male woodcock as determined from annual singing-ground surveys (Base year - 1970)

5. Graph the adjusted figures for the index years, rather than the figures actually recorded each of these years.

Results

In the 1970 singing-ground survey there was no change in the number of woodcock heard per comparable route in the Eastern Region, which consists of Atlantic Coast States and Provinces, plus Vermont (table 1). An increase of 3.12 percent occurred in the Western Region, which consists of States and Provinces west of the axis of the Allegheny Mountains. When the data were weighted on a rangewide basis, the index increased only 2.11 percent. Following is a summary of the annual changes for the past 6 years based on data weighted regionally and rangewide.

<u>Year</u>	<u>Percent change from previous year</u>		
	<u>Eastern Region</u>	<u>Western Region</u>	<u>Rangewide</u>
1965	- 0.4	-11.1	- 6.5
1966	+ 2.4	- 0.5	+ 1.7
1967	+ 1.5	- 3.5	0
1968	- 8.4	- 4.5	- 6.9
1969	+ 4.2	+12.1	+ 8.8
1970	0	+ 3.1	+ 2.1

Figure 1 shows that the trend of the breeding population index, expressed as the number of woodcock heard per comparable route, has been upward over the past 13 years. However, there is some indication of a leveling trend during the past 6 years, with the 2 peak years, 1964 and 1970, nearly equal.

WING-COLLECTION SURVEY

In 1959 a wing-collection survey was initiated in the United States to determine the age and sex composition of the woodcock harvest. The primary objective was to provide data on the reproductive success of the species, but the survey also produces information on changes in geographic and chronologic distribution and size of the harvest. Because serially numbered envelopes are used for each day's bag, it is possible to determine both daily and seasonal hunting success.

Hunter response to the wing-collection survey has been generally good since its inception in 1959. Annual submissions of wings during

the first 10 years ranged from 8,786 the first year to 18,439 in the 1968-69 season and averaged 13,251 per season. Wing contributions from the 1969-70 hunting season dropped slightly from the previous season to 17,940. In addition to the regular survey, a number of wings from special study areas were received. Because data from these sources are not comparable in all respects with data resulting from operational surveys, they are not included in the general analysis. However, they will be used in a later report.

Procedures

Because we lack a uniform method for sampling woodcock hunters, it is necessary to assemble a mailing list for participants in the wing-collection survey from several sources. To facilitate data analysis, each source was given a code number as follows:

- Code 1 - Previous years' Code 1, 2, 4, and 7 hunters who submitted wings.
- Code 2 - Waterfowl mail survey hunters who reported hunting woodcock.
- Code 4 - Requested participation or proposed by fellow hunter.
- Code 7 - Appeared on both Code 1 and Code 9 lists.
- Code 8 - Previous years' Code 9 hunters who submitted wings.
- Code 9 - From list provided by State from its kill survey (except in New Jersey, where list was from woodcock hunting stamp purchasers).

The most productive of these in wings submitted, and the sole source of comparable data, is the list of hunters who cooperated the preceding season (Code 1). Lists of hunters' names and addresses obtained from participants in State game kill surveys (Code 9) probably produce the least biased samples within each State; however, procedural variations between States introduce new biases. Also, many States either have no kill survey or do not inquire about woodcock in their questionnaires. The number of names added annually by request of survey participants or their friends (Code 4) is relatively small. The list of woodcock hunters from the Bureau's waterfowl mail survey (Code 2) is the largest source of names. However, the number of wings submitted per Code 2 contact is very low. A significant bias in this source is the large State-to-State variation in the ratio of waterfowl hunters to total hunters. For example, both Louisiana and Pennsylvania are important woodcock harvest States. However, only one Pennsylvania hunter in 20 purchases a duck stamp; in Louisiana one-third of all hunters purchase duck stamps. It is evident that precise analysis of a survey sample originating from such varied sources is impossible. However, it is believed that major changes in woodcock productivity and in harvest rates can be detected.

The mechanics of collecting and processing wings and analyzing data were the same as for the 1968-69 season (Clark, 1970). The distribution of contacts and combined response rates by States are shown in table 3. A total of 7,800 hunters was contacted in the 1969-70 woodcock survey. This represents a 5 percent increase over the 1968-69 survey largely due to the addition of Code 8 contacts. This code was established to determine whether hunters from this source provide data similar to that from Code 1 hunters. Also, hunters from all available sources were added in those States where larger samples are needed.

Results

The number of wings received declined slightly from 18,439 in 1968-69 to 17,940 in 1969-70. It will be noted that the wing total may vary slightly between different tables. This is because incomplete information was given on a few wing envelopes, necessitating the exclusion of the wings in those envelopes from some tabulations.

A listing by State of the number of cooperators, envelopes, and wings received for the past three hunting seasons is shown in table 4. Numbers of envelopes are shown because each envelope represents 1 day's hunt by one hunter, consequently, the bag per successful day.

Comparison of sample source.--Table 5 lists response rate and wings contributed in the three principal categories of hunters. Data from Code 7 hunters are included with both Code 1 and Code 9, since these hunters originally appeared on both those lists. Weighted averages in this comparison were similar to those from the 1968-69 season, as indicated in the following summary:

		<u>Code 1</u>	<u>Code 2</u>	<u>Code 9</u>
Percent response	1968-69	61.1	18.4	13.9
	1969-70	58.6	16.5	14.3
Wings received per contact	1968-69	8.0	0.9	0.7
	1969-70	6.3	0.7	0.7
Wings received per contributor	1968-69	13.2	4.8	4.9
	1969-70	10.8	4.0	5.2

Table 6 further illustrates variability in data from the three principal sample sources. As in the previous season, data from New Jersey Code 9 hunters differed strikingly from Code 9 hunters in other States. This is because New Jersey Code 9 hunters are from lists of those who purchased a special stamp required for woodcock hunting prior to the regular small game season.

Although State hunter lists (Code 9) have been used only 2 years, results were examined to determine whether these lists could be substituted for Code 1 lists to minimize biases. Four States provided lists of representative hunters for the 2 consecutive years. Data from wings and envelopes contributed by these hunters were compared with data provided by cooperators from other sources. The results are inconsistent. For example, a comparison of productivity indexes, as represented by immature-per-adult-female ratios, from Code 9 data (State-list hunters), with indexes from data from all other hunters in the survey, showed the following:

<u>State</u>	<u>Percent change in productivity 1968-69 to 1969-70</u>	
	<u>Code 9 Hunters</u>	<u>Other Hunters</u>
Maine	-11.34	-22.12
Michigan	+ 9.51	-23.57
New York	-11.33	-15.53
Wisconsin	+74.76	- 7.03

Additional years' accumulation of data may clarify some points. Lists from additional States have been solicited for the 1970-71 season.

Weighting factors.--Because wings received from each State were not always proportional to the woodcock harvest in that State, it was necessary to weight data used in computing overall productivity and harvest index trends.

Because we lack a uniform sampling frame for woodcock hunters, a completely satisfactory weighting method has not been devised. The crude procedure now in use is based upon a combination of data from the Bureau's waterfowl mail survey, "duck stamp" sales, and State license sales (Clark, 1970). The derivation of weighting factors used in computing productivity and harvest indexes for the 1969-70 season is shown in table 7.

Productivity index.--In this report reproductive success is used as a measure of productivity. Woodcock can be aged and sexed by wing plumage characters (Martin, 1964). The ratio of immatures to adult females in the harvest, as determined from the wing-collection survey, provides a measure of reproductive success during the preceding breeding season (table 8). There is considerable variation in immature-adult female ratios between different harvest areas (States or Provinces) and between different years for the same harvest areas. These variations

are probably caused by differences in hunting season dates, weather conditions, hunting season restrictions due to fire hazard, and possibly differential migration coupled with differential vulnerability to hunting among sex and/or age groups. However, the annual change in age ratios is surprisingly small when rangewide data are weighted and combined (fig. 2).

It should be pointed out that variation in the weighted index of woodcock productivity due to differences in the hunters sampled has been eliminated by using only data from comparable hunters; i.e., hunters who participated in the survey both years (table 9). A small decrease of 7.03 percent in the age ratio occurred during the 1969-70 hunting season.

A downward trend in productivity from 1959 to 1969 is apparent when age ratios are graphically depicted using annual percent change, with 1969-70 as the base year. The 1969-70 age ratio marks the low point (fig. 2). The apparent downward trend of the long-term index may or may not indicate a steady decline in reproductive success in the woodcock population. In at least one State, scarcity of immature birds in the 1969 summer banded sample suggested very poor reproductive success, possibly resulting from cold wet weather in the critical hatching period. Also, the late gradual fall migration in the Atlantic Region in 1969 may have influenced the age ratio in the harvest. Additional years' data will indicate whether the 1969-70 downturn was part of the long-term trend or a temporary interruption of an upturn in woodcock productivity.

Hunter success index.--An appraisal of trends in the woodcock harvest--both daily and seasonal success--has been attempted by showing annual percentage of change in the number of wings returned by hunters who participated in the survey for 2 consecutive years (table 10). Average daily harvests have changed little from year to year. The trend was downward from 1963 to 1966, upward from 1966 to 1968, but again down slightly in the 1969-70 season.

Average seasonal harvests have fluctuated more than average daily harvests. The overall general trend has been upward, but declined slightly in the 1968-69 season and more sharply (11.1 percent) in the 1969-70 season (fig. 2). Hunters' comments on wing envelopes suggest that unusual weather conditions may have been an important factor in limiting hunter success during the 1969-70 season.

Hunter success, along with other factors, needs further study before woodcock population trends can be related to hunting pressure. Such relationships may become apparent if information can be obtained through a uniform sampling frame for migratory upland game bird hunters, and from accumulating banding data.

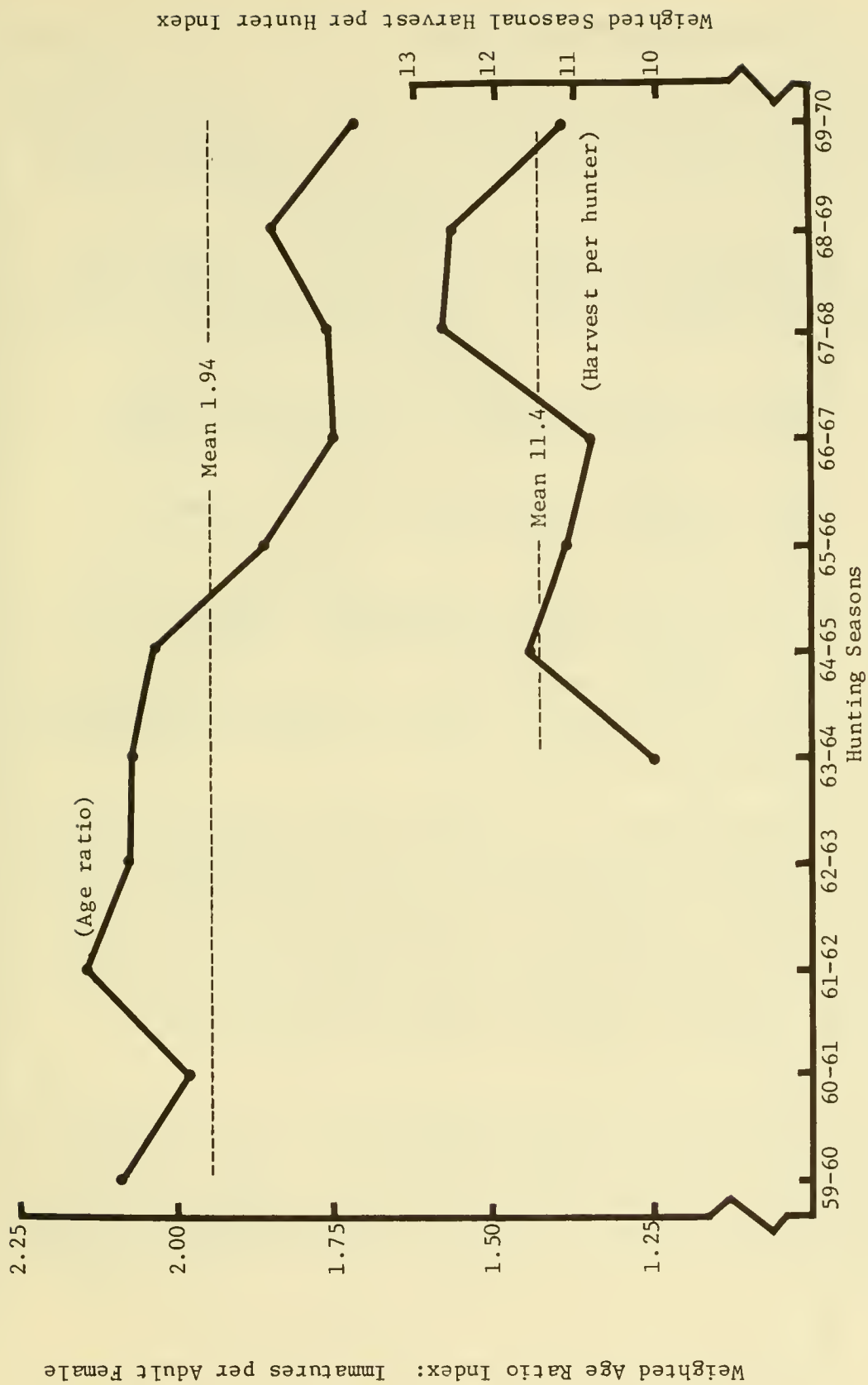


Figure 2.--Weighted age ratio and seasonal harvest per hunter indexes, as determined from annual woodcock wing-collection survey data from comparable hunters (Base year - 1969-70) .

Regional analysis of wing-collection data

Sex and age ratios.--An investigation of factors affecting productivity and hunter success was initiated this year. Since differential migration by sex-age groups in correlation with the timing of hunting seasons would materially influence the productivity index, an analysis of regional sex and age ratios by time periods was the first step.

There is some evidence that within the woodcock range there may be less intermingling of woodcock from the Central and the Atlantic Regions than was formerly supposed. Data from the two regions were analyzed separately. Within each region, three subregions were established (fig. 3). The criteria used in selecting these were:

1. Northern subregion--States with relatively high density woodcock breeding populations where the harvest consists of a high proportion of locally reared birds.
2. Middle subregion--States with moderately low density breeding populations where the harvest consists more of migrant woodcock.
3. Southern subregion--States with small breeding populations where the harvest consists primarily of wintering and migrant woodcock.

Naturally, there is overlapping of conditions between these subregions. Although State boundaries do not accurately delineate the areas described, they serve our present purposes.

A new computer program in the wing-collection analysis divided the harvest, as represented by the wing collection, into 10-day periods (table 11). These minor periods were grouped into three major periods for each subregion. Grouping dates were selected that placed approximately 50 percent of the wings in the middle period and 25 percent each in the first and third periods. If seasonal trends in sex or age ratios occur, the broader separation between early and late season should make them more noticeable. Data for the 1968-69 and 1969-70 seasons are summarized in table 12 (Central Region) and table 13 (Atlantic Region).

In some States the wing sample was adequate for the same comparison as in the subregions. For individual States it was possible to pinpoint the three harvest periods more precisely. Data are summarized for four States in the Central Region (table 14) and four Atlantic Region States (table 15). A north-to-south spread was sought in each table, but inadequate samples in some States prevented optimum distribution.

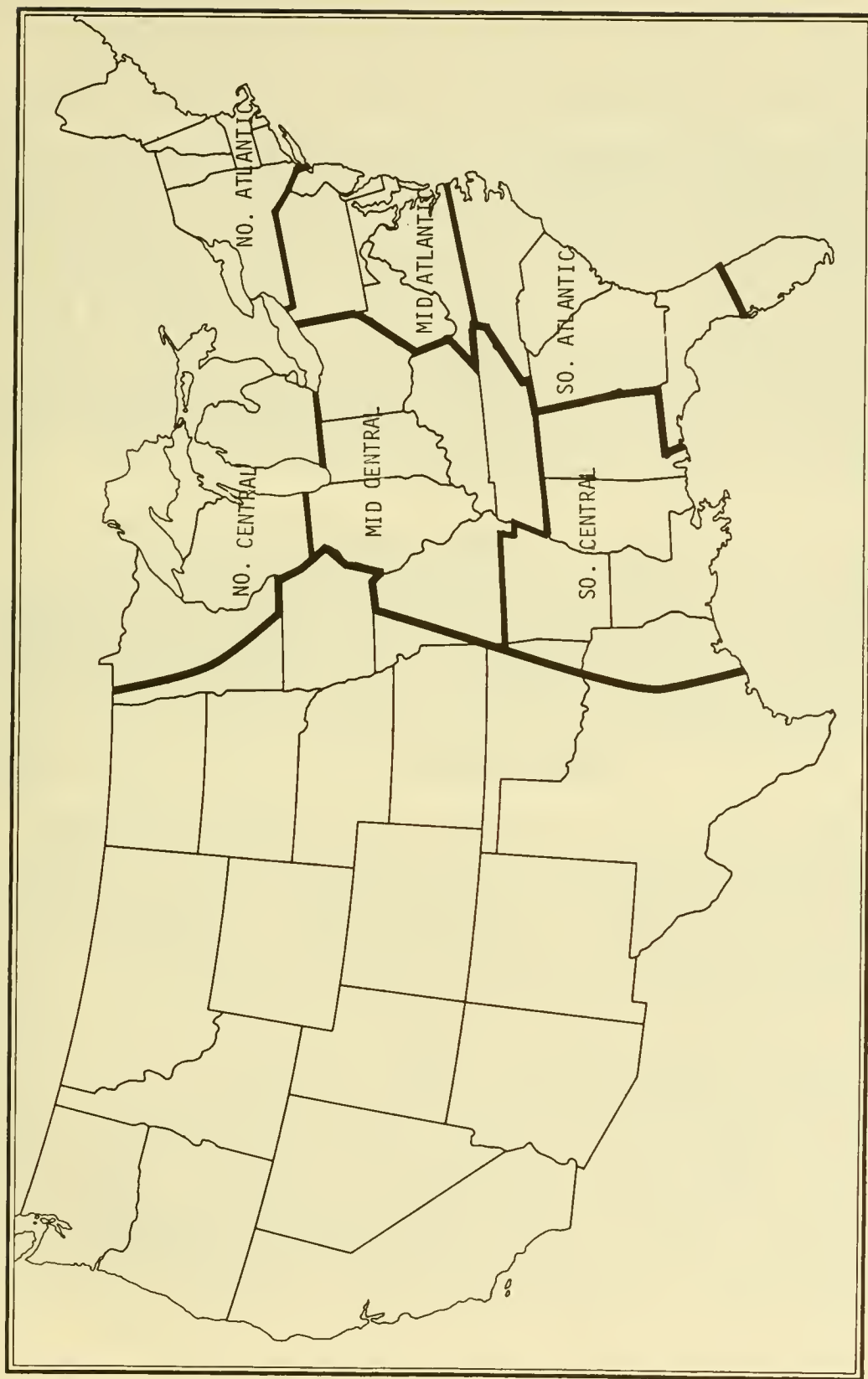


Figure 3.--Reference areas of U.S. woodcock wing collection

In view of the effect of weather on time of migration, conclusive results could not be expected from only 2 years' data. Inconsistencies will be noted in sex and age ratios in the tables. However, there is reason to believe that accumulating data may reveal enlightening trends.

Timing of harvest.--Distribution of the harvest as shown by 10-day wing-collection periods provides some insight into timing of the fall migration. Inasmuch as substantial numbers of woodcock are produced in Canada, the harvest in all States includes some migrants. It is possible, with a 65-day season, to adequately encompass the period of greatest abundance of woodcock within a particular State. In those few States where the most advantageous hunting season for a resident game bird is a prime consideration in determining the woodcock season opening date, the period of greatest woodcock abundance may be missed in many, if not most, years. A north-to-south distribution of the harvest is shown for the Central Region (table 16) and Atlantic Region (table 17). Although larger samples are needed for some States, the tables provide some insight into the chronology of fall migration.

It should be noted that in both tables no adjustment was made for periods in which the beginning or end of the season occurred, and which encompassed less than 10 days of hunting. Heavier hunting pressure on the opening day or first weekend may partially compensate for a shortened period at the beginning of the season. However, concentration of hunting effort on the opening day of the season is not as prevalent among woodcock hunters as it is among sportsmen hunting other game.

RANGEWIDE HARVEST

No single sampling frame is available for measuring the woodcock harvest as there is for measuring the waterfowl harvest in the United States. Based on information from the national survey of U.S. waterfowl hunters and various State kill surveys, the 1965-66 U.S. woodcock kill was estimated at approximately 900,000 (Goudy, 1967). Information from the same sources suggests that the 1968-69 harvest was over one million, an increase of at least 10 percent in 3 years.

Because the waterfowl hunter mail survey is the only source of data having rangewide comparability, recent woodcock harvest data derived from this survey (MacDonald and Martin, in press) were examined for trends. To minimize annual fluctuations, 2-year averages were used, and the data were divided into three periods. Table 18 shows that during the 1964-65 to 1969-70 period waterfowl hunters increased 17 percent in woodcock hunting States. In the same period, the number of waterfowl hunters who hunted woodcock increased 37 percent and their woodcock harvest increased 34 percent. Samples from most Middle and Southern Zone States are small, but the increases there are especially noteworthy.

Except in Louisiana, woodcock have been lightly hunted in these migration and wintering States.

Table 18 and the preceding discussion apply only to waterfowl hunters, 16 years of age or older, who purchased migratory bird hunting stamps. Those who purchased stamps for purposes other than hunting are excluded. Only about 10 percent of all licensed hunters purchase these stamps. Of the remaining 90 percent, there is no known measurement of the number who hunt woodcock. The proportion must be smaller than among waterfowl hunters or the U.S. woodcock harvest would exceed five million birds annually--five times the estimate based on other sources of information.

Unlike the United States, Canada has a migratory game bird hunting permit which provides a suitable sampling frame for measuring the Canadian woodcock harvest. This survey indicates an increase in the Canadian woodcock kill from approximately 90,000 in 1967-68 to 100,000 in 1968-69 and 116,000 in 1969-70 (Benson, 1968, 1969, 1970).

RESEARCH STATUS

Nine States and Provinces completed second-year checks of randomly selected woodcock singing-ground survey routes in 1969. Ohio established random routes and completed first-year checks of them, and 12 new random routes were activated in Illinois. Ten-minute blocks in which new survey routes may be established were selected at random in Quebec. When additional routes in Illinois and Quebec are established, all significant portions of woodcock breeding range will be sampled on randomly selected survey routes.

Emphasis on woodcock research has now shifted to breeding ground banding and to specific problem studies. Federally funded woodcock projects in progress in fiscal year 1970 are listed in table 19. Banding is a particularly pressing need and pilot banding projects have been initiated in several States and Provinces. Since several newly developed techniques are involved, additional training sessions are needed before a comprehensive banding program can be implemented. Many different organizations at the Federal and State-Provincial level are involved. While this somewhat complicates coordination of plans for training, it will increase the output of banded woodcock for the limited funds and manpower that each organization can allot to this species. Expansion of banding effort in the 10-year period, 1960-69, is reflected in table 20. The increase, particularly evident in summer banding, is graphically shown in figure 4. An analysis of banding and recoveries through 1968 (Krohn, 1970) has provided additional insight into woodcock movements.

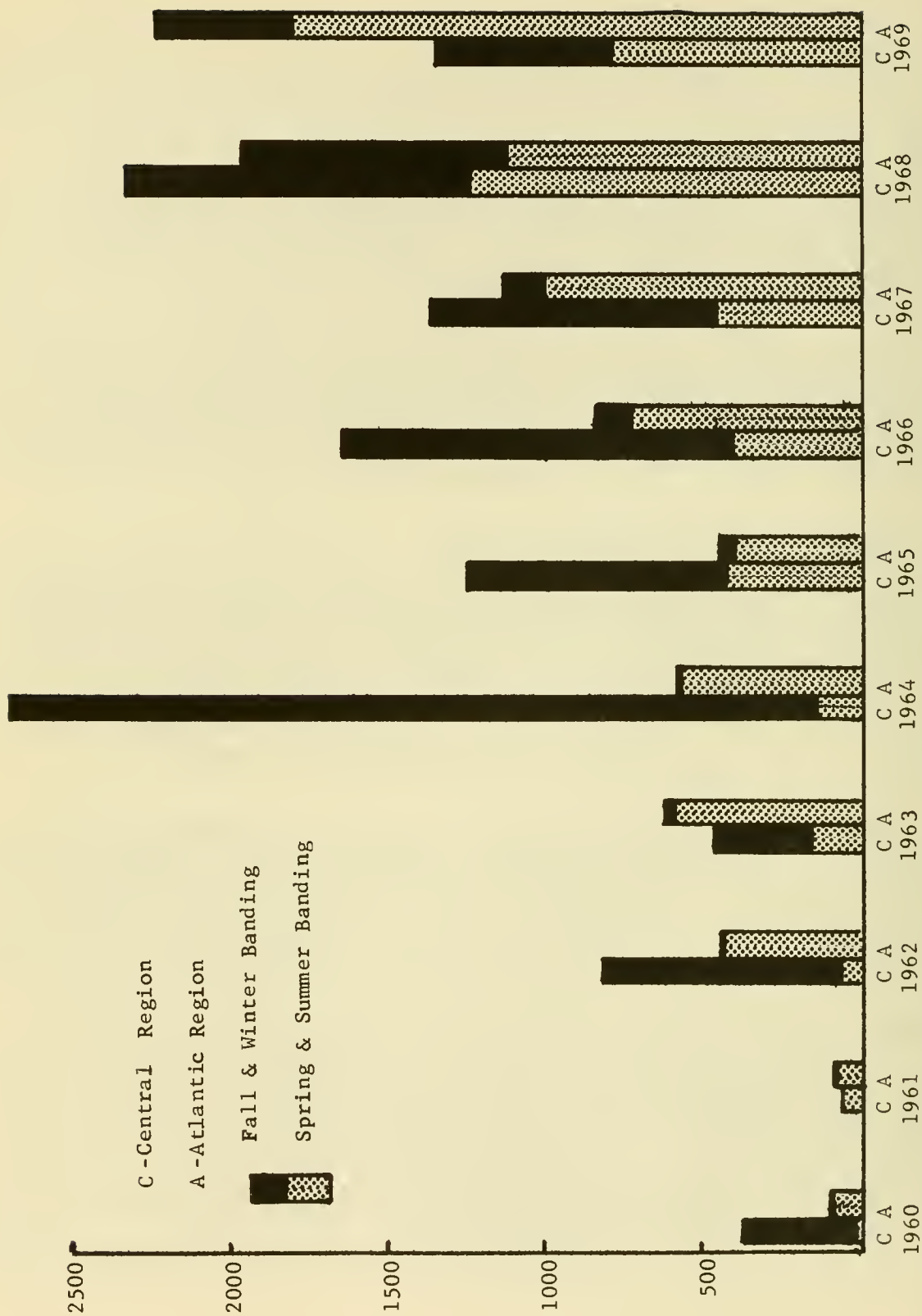


Figure 4.--Woodcock banding by regions, 1960-69 (excluding experimental birds).

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APPENDIX

Table 1.--Woodcock breeding population indexes as indicated by singing-ground surveys in 1969 and 1970

State or Province	Number of routes conducted				Comparable routes*	Woodcock heard per comparable route**	
	1969		1970			1969	1970
	Mgmt.	Random	Mgmt.	Random			
<u>EASTERN REGION</u>							
Connecticut	13	11	13	11	7 (7)	2.43	3.00
Delaware	--	3	--	3	3	.67	1.33
Maine	32	59	--	58	52	3.88	4.56
Maryland	--	22	--	22	18	2.11	1.56
Massachusetts	8	19	8	19	18 (8)	2.22	2.72
New Brunswick	4	24	--	44	5	9.60	10.60
New Hampshire	9	16	9	17	12 (9)	4.58	5.33
New Jersey	--	12	--	12	11	2.45	2.36
New York	--	82	--	80	72	3.44	2.65
North Carolina	--	52	--	34	37	.00	.03
Nova Scotia	--	21	--	46	16	1.69	1.44
Pennsylvania	--	74	--	57	64	1.52	1.70
Prince Edward Island	--	11	--	11	0	--	--
Rhode Island	--	4	--	4	4	.75	1.00
Vermont	5	22	5	21	19 (5)	2.16	3.11
Virginia	--	80	--	77	67	1.13	1.04
REGIONAL TOTALS & WEIGHTED AVGS.***	71	512	35	516	405 (29)	2.40	2.40
REGIONAL INDEX CHANGE							0%
<u>WESTERN REGION</u>							
Illinois	4	--	4	12	-- (4)	1.25	1.50
Indiana	--	60	--	45	40	.83	.83
Iowa	10	--	--	--	--	--	--
Michigan	--	135	--	122	113	4.40	4.18
Minnesota	10	60	--	56	29	1.17	1.10
Ohio	12	--	10	82	-- (6)	11.00	9.67
Ontario	--	72	--	65	45	6.73	7.58
West Virginia	--	22	--	26	49	1.06	.61
Wisconsin	4	116	--	91	71	1.94	1.86
REGIONAL TOTALS & WEIGHTED AVGS.***	40	465	14	499	347 (10)	3.21	3.31
REGIONAL INDEX CHANGE							+3.12%
<u>RANGEWIDE TOTALS & WEIGHTED AVGS.***</u>							
WEIGHTED AVGS.***	111	977	49	1,015	752 (39)	2.85	2.91
RANGEWIDE INDEX CHANGE							+2.11%

* Includes routes carried as constant zero routes (not actually conducted in 1970) but excludes comparable management routes shown separately in parenthesis.

** Figure shown includes only random routes except in Illinois and Ohio.

***Weighted averages are sums of products of woodcock heard per comparable route and the corresponding State or Province percentage of the total land area sampled. States or Provinces excluded where one comparable route represents more than 2,000 square miles or where birds heard per route is less than 0.50.

Table 2--Computation of woodcock singing-ground survey weighting factors

SURVEY AREA*	Land Area** (Sq. Mi.)	Comparable Routes	Sq. Mi. per Comp. Rt.	Weighting Factor	
				Regional	Range-wide
EASTERN REGION					
Connecticut	4,870	7	696	.0207	.0091
Delaware	1,982	3	661	.0084	.0037
Maine	30,933	52	595	.1313	.0576
Maryland	9,891	18	550	.0420	.0184
Massachusetts	7,833	18	435	.0333	.0146
New Hampshire	9,033	12	753	.0384	.0168
New Jersey	7,532	11	685	.0320	.0140
New York	47,869	72	665	.2032	.0891
Nova Scotia	20,402	16	1,275	.0866	.0380
Pennsylvania	45,025	64	703	.1912	.0838
Rhode Island	1,049	4	262	.0045	.0020
Vermont	9,274	19	488	.0394	.0173
Virginia	39,841	67	595	.1692	.0742
REGIONAL TOTALS	235,534	363	649	1.0002	
WESTERN REGION					
Indiana	36,189	40	905	.1200	.0674
Michigan	56,818	113	503	.1885	.1058
Minnesota	57,300	29	1,976	.1901	.1067
Ontario	72,599	45	1,613	.2408	.1352
West Virginia	24,084	49	492	.0799	.0449
Wisconsin	54,464	71	767	.1807	.1014
REGIONAL TOTALS	301,454	347	869	1.0000	
RANGEWIDE TOTALS			756		1.0000

* Excluding States and Provinces where each comparable route represents more than 2,000 square miles or where woodcock heard per comparable route was less than 0.50.

** Land area only (inland water excluded) as listed in 1970 Commercial Atlas and Marketing Guide - Rand-McNally & Co.

Table 3.--Distribution of contacts and response rate in 1969-70 woodcock wing-collection survey

State of residence	Packets mailed by contact code*						Packets returned	Total hunters contacted	Total wings received**	Wings per contact
	1	2	4	7	8	9				
Ala.	8	18	1	--	--	--	--	27	36	1.3
Ark.	5	19	--	--	--	--	--	24	43	1.8
Conn.	130	170	12	--	--	--	1	311	1062	3.4
Del.	9	47	--	--	--	--	1	55	17	0.3
Fla.	5	73	--	--	--	--	1	77	26	0.3
Ga.	20	59	--	--	--	--	--	79	42	0.5
Ill.	9	38	--	--	--	--	--	47	69	1.5
Ind.	24	51	5	--	2	--	--	82	178	2.2
Iowa	--	6	1	--	--	--	--	7	0	--
Kans.	1	12	--	--	--	--	1	12	0	--
Ky.	2	13	--	--	--	362	13	364	7	0.02
La.	32	103	10	--	--	--	1	144	678	4.7
Maine	153	160	12	20	80	569	8	986	2957	3.0
Md.	9	126	4	--	--	--	2	137	169	1.2
Mass.	124	248	11	1	--	136	7	513	1813	3.5
Mich.	137	277	14	1	58	561	4	1044	1524	1.5
Minn.	35	43	6	--	--	--	--	84	330	3.9
Miss.	10	17	1	--	--	--	--	28	36	1.3
Mo.	6	33	2	--	--	--	1	40	15	0.4
N.H.	79	129	2	--	--	--	4	206	598	2.9
N.J.	122	201	16	67	82	280	12	756	2561	3.4
N.Y.	146	148	25	2	93	504	4	914	2006	2.2
N.C.	24	76	2	--	--	--	1	101	62	0.6
Ohio	71	120	8	--	--	--	1	198	510	2.6
Okla.	--	12	--	--	--	--	--	12	0	--
Pa.	156	216	9	--	--	--	1	380	977	2.6
R.I.	25	24	3	--	--	--	--	52	238	4.6
S.C.	11	61	1	--	--	--	--	73	64	0.9
Tenn.	28	13	--	--	--	--	--	41	30	0.7
Tex.	5	14	--	--	--	--	--	19	95	5.0
Vt.	46	75	2	--	--	--	--	123	323	2.6
Va.	14	46	47	--	--	--	2	105	105	1.0
W. Va.	15	20	2	--	--	--	--	37	136	3.7
Wis.	87	292	22	1	80	243	3	722	1003	1.4
TOTALS	1548	2960	218	92	395	2655	68	7800	17710	2.3

* Code 1 - Previous years Code 1, 2, 4, and 7 hunters who submitted wings.

Code 2 - Waterfowl mail survey hunters who reported hunting woodcock.

Code 4 - Requested participation or proposed by fellow hunter.

Code 7 - Appeared on both Code 1 and Code 9 lists.

Code 8 - Previous years Code 9 hunters who submitted wings.

Code 9 - From list provided by State from its kill survey (except in New Jersey, where list was from woodcock hunting stamp purchasers).

** Excluding wings with incomplete data or from Special Study areas.

Table 4.--Data from woodcock wing-collection surveys conducted during the 1967-68, 1968-69, and 1969-70 hunting seasons

State of residence	Number of cooperators			Number of envelopes			Number of wings			Avg. no. of wings per envelope			Avg. no. of wings per cooperator		
	67-68	68-69	69-70	67-68	68-69	69-70	67-68	68-69	69-70	67-68	68-69	69-70	67-68	68-69	69-70
Ala.	6	8	8	26	23	24	53	48	36	--	--	--	--	--	--
Ark.	3	5	5	8	10	29	11	14	43	--	--	--	--	--	--
Conn.	113	130	137	316	419	476	633	931	1062	2.0	2.2	2.2	6	7	8
Del.	8	9	8	12	22	15	16	36	17	--	--	--	--	--	--
Fla.	9	5	7	15	11	18	31	16	26	--	--	--	--	--	--
Ga.	18	20	17	24	40	27	25	50	42	--	--	--	--	--	--
Ill.	13	9	7	33	43	35	34	99	69	--	--	--	--	--	--
Ind.	17	26	21	58	79	76	129	198	178	2.2	2.5	2.3	8	8	8
Ky.	3	2	5	4	2	7	5	2	7	--	--	--	--	--	--
La.	52	32	47	161	157	223	370	444	678	2.3	2.8	3.0	7	14	14
Maine	145	253	247	700	1049	1117	1803	2941	2957	2.6	2.8	2.6	12	12	12
Md.	21	9	28	67	57	71	140	149	169	2.1	2.6	2.4	7	17	6
Mass.	117	128	166	529	557	733	1473	1573	1813	2.8	2.8	2.5	13	12	11
Mich.	132	195	199	561	716	641	1402	1768	1524	2.5	2.5	2.4	11	9	8
Minn.	36	35	31	126	113	114	390	279	330	3.1	2.5	2.9	11	8	11
Miss.	6	10	6	12	29	18	23	68	36	--	--	--	--	--	--
Mo.	11	5	7	15	7	11	18	13	15	--	--	--	--	--	--
N.H.	80	80	68	282	353	271	599	855	598	2.1	2.4	2.2	7	11	9
N.J.	119	273	245	488	1032	1062	1186	2622	2561	2.4	2.5	2.4	10	10	10
N.Y.	185	236	244	739	800	853	1864	1976	2006	2.5	2.5	2.4	10	8	8
N.C.	23	24	17	47	55	34	68	80	62	--	--	--	--	--	--
Ohio	78	71	60	243	251	202	613	648	510	2.5	2.6	2.5	9	9	9
Pa.	131	157	144	492	556	434	1211	1381	977	2.5	2.5	2.3	9	9	7
R.I.	26	25	26	97	85	100	257	216	238	2.6	2.5	2.4	10	9	9
S.C.	18	11	15	34	24	32	48	55	64	--	--	--	--	--	--
Tenn.	28	1	11	31	2	18	36	2	30	--	--	--	--	--	--
Tex.	8	5	4	22	20	23	34	43	95	--	--	--	--	--	--
Vt.	41	47	41	268	242	171	694	545	323	2.6	2.3	1.9	17	12	8
Va.	18	14	16	41	25	48	67	45	105	--	--	2.2	--	--	7
W. Va.	13	15	13	45	41	52	105	99	136	2.3	--	2.6	8	--	10
Wis.	107	164	169	326	465	495	747	1047	1003	2.3	2.3	2.0	7	6	6
Other	--	--	--	--	--	--	1785	196	230	--	--	--	--	--	--
TOTALS	1587	2004	2020	5825	7285	7436	15874	18439	17940	2.6*	2.5*	2.4*	9.5*	9.1*	8.8*

*Unweighted mean (includes data from all States, but excludes information from the special study areas and Canadian Provinces).

Table 5--Comparison of hunters and rate of wings received for principal code categories

State of Residence	No. of Contacts			No. Responding			No. of Wings			% Responding			Wings/Contact			Wings/Contributor		
	1	2	9	1	2	9	1	2	9	1	2	9	1	2	9	1	2	9
Ala.	8	18		4	3		26	9		50	17		3.2	0.5		6.5	3.0	
Ark.	5	19		3	2		34	8		60	11		6.8	0.4		11.3	4.0	
Conn.	130	169		77	42		645	145		59	25		5.0	0.9		8.4	3.5	
Del.	9	46		4	2		10	2		44	4		1.1	T		2.5	1.0	
Fla.	5	72		1	6		8	18		20	8		1.6	0.2		8.0	3.0	
Ga.	20	59		6	9		17	23		30	15		0.8	0.4		2.8	2.6	
Ill.	9	38		3	0		15	--		33	0		1.7	0.0		5.0	0.0	
Ind.	24	51		10	6		79	43		42	12		3.3	0.8		7.9	7.2	
Iowa	--	6		--	0		--	--		--	0		--	0.0		--	0.0	
Kans.	1	11		0	0		--	--		0	0		0.0	0.0		0.0	0.0	
Ky.	2	13	349	0	1	5	--	1	6	0	8	1	0.0	0.1	T	0.0	1.0	1.2
La.	32	102		25	13		506	106		78	13		15.8	1.0		20.2	8.2	
Maine	172	159	584	100	27	98	1620	193	851	66	17	17	9.4	1.2	1.5	16.2	7.1	8.7
Md.	9	124		5	16		74	34		56	13		8.2	0.3		14.8	2.1	
Mass.	125	247	131	60	47	23	689	242	63	48	19	18	5.5	1.0	0.5	11.5	5.1	2.7
Mich.	138	276	559	90	44	52	1149	125	170	65	16	9	8.3	0.5	0.3	12.8	2.8	3.3
Minn.	35	43		20	7		245	17		57	16		7.0	0.4		12.2	2.4	
Miss.	10	17		5	1		35	1		50	6		3.5	0.1		7.0	1.0	
Mo.	6	32		3	5		5	6		50	16		0.8	0.2		1.7	1.2	
N.H.	78	126		49	18		452	125		63	14		5.8	1.0		9.2	6.9	
N.J.	188	196	341	109	28	95	1178	90	763	58	14	28	6.3	0.5	2.2	10.8	3.2	8.0
N.Y.	148	147	503	99	24	83	1191	90	334	67	16	17	8.0	0.6	0.7	12.0	3.8	4.0
N.C.	24	75		8	7		48	11		33	9		2.0	0.1		6.0	1.6	
Ohio	71	119		39	16		315	66		55	13		4.4	0.6		8.1	4.1	
Okla.	--	12		--	0		--	--		--	0		--	0.0		--	0.0	
Pa.	156	215		103	39		791	92		66	18		5.1	0.4		7.7	2.4	
R.I.	25	24		10	4		40	12		40	17		1.6	0.5		4.0	3.0	
S.C.	11	61		4	11		11	53		36	18		1.0	0.9		2.8	4.8	
Tenn.	28	13		10	1		29	1		36	8		1.0	0.1		2.9	1.0	
Tex.	5	14		4	0		94	--		80	0		18.8	0.0		23.5	0.0	
Vt.	46	75		27	13		258	40		59	17		5.6	0.5		9.6	3.1	
Va.	14	46		5	7		33	56		36	15		2.4	1.2		6.6	8.0	
W. Va.	15	20		9	2		54	20		60	10		3.6	1.0		6.0	10.0	
Wis.	88	290	243	60	51	34	599	137	96	68	18	14	6.8	0.5	0.4	10.0	2.7	2.8
TOTALS and																		
Wtd. Avgs.	1637	2935	2710	952	452	390	10250	1766	2283	58.6	16.5	14.3	6.3	0.7	0.7	10.8	4.0	5.2

Table 6--Comparison of Code-9* data with those from other codes in five States

	Maine	Michigan	New Jersey	New York	Wisconsin
Hunter Contacts					
State Total**	974	1030	740	889	700
Code 9*	564	558	274	501	242
Code 9 Percent of Total	57.9	54.2	37.0	56.4	34.6
Wings Submitted					
State Total**	2776	1480	2045	1743	977
Code 9*	851	170	763	334	96
Code 9 Percent of Total	30.7	11.5	37.3	19.2	9.8
First Week of Season Wings***					
Code 1*					
Number	173	227	111	Wings	30
Percent of Season Total	10.7	19.8	9.4	coded	5.0
Code 2*				by county	
Number	35	50	10		20
Percent of Season Total	18.1	40.0	11.1	Zone	14.6
Code 9*				season	
Number	111	33	88	openings	11
Percent of Season Total	13.0	19.4	11.5	do not	11.5
State Total**				follow	
Number	355	321	223	county	68
Percent of Season Total	12.8	21.7	10.9	lines	7.0
Immature/Adult Female Ratio					
Code 1*					
Immatures	715	492	677	514	300
Imm./Ad. Female	1.54	1.21	2.44	1.37	1.73
Code 2*					
Immatures	90	51	58	34	73
Imm./Ad. Female	1.73	1.19	4.46	0.89	1.62
Code 9*					
Immatures	421	74	417	159	57
Imm./Ad. Female	1.70	1.35	2.18	1.67	2.04
State Total**					
Immatures	1294	631	1201	748	502
Imm./Ad. Female	1.64	1.22	3.22	1.32	1.73

* Code 1 - Submitted wings the previous year.

Code 2 - Hunters on waterfowl mail survey who reported hunting woodcock.

Code 9 - From list provided by State from its kill survey (except New Jersey, where list was from woodcock hunting stamp purchasers).

(Note: Code 7-figures are included with both Code-1 and Code-9 results.)

** Excluding Code 4.

***Six days in Maine and New Jersey (Sunday hunting prohibited); 7 days in Michigan, New York, and Wisconsin.

Table 7--Derivation of weighting factors for the woodcock wing-collection survey

STATE*	A		B		C		D		E		F		G		H		J		K		L		M	
	Hunting License Holders		1968-69		1967-68		1968-69		1967-68		1968-69		1967-68		1968-69		Mean		Percent of Mean		State Kill Index		State Weight Factor	
Conn.	71,915	73,722	9,479	12,005	12,277	15,746	7,5868	6.1409	6.8639	64.46	9,032	.0250												
La.	317,737	322,076	108,682	90,278	66,219	77,347	2.9235	3.5676	3.2456	30.48	21,879	.0605												
Maine	203,284	205,560	13,223	14,696	27,845	38,041	15.3735	13.9875	13.6805	128.47	42,321	.1171												
Mass.	138,015	140,896	21,119	23,758	20,837	29,901	6.5351	5.9305	6.2328	58.53	14,849	.0411												
Mich.	903,545	918,175	95,187	88,742	73,866	43,125	9.4923	10.3466	9.9194	93.15	54,490	.1508												
Minn.	473,402	455,660	157,937	140,934	17,100	8,115	2.9974	3.2331	3.1553	29.63	3,736	.0103												
N.H.	93,146	95,767	6,726	7,656	8,232	15,489	13.8486	12.5088	13.1787	123.76	14,678	.0406												
N.J.	181,871	181,407	28,935	30,384	20,916	25,249	6.2855	5.9705	6.1280	57.55	13,283	.0367												
N.Y.	731,601	725,305	77,586	86,492	77,397	78,166	9.4295	8.3858	8.9077	83.65	65,066	.1800												
Ohio	490,223	501,537	30,175	28,911	10,211	15,756	16.2460	17.3476	16.7968	157.74	20,481	.0567												
Pa.	1,062,121	1,102,749	52,084	58,055	40,383	31,867	20.3925	18.9949	19.6937	184.94	66,810	.1848												
Vt.	144,689	144,570	5,725	5,884	9,151	4,558	25.2732	24.5700	24.9216	234.04	16,040	.0444												
Wis.	597,119	631,875	110,479	105,114	41,597	28,506	5.4048	6.0113	5.7081	53.60	18,789	.0520												

* Thirteen States having substantial woodcock harvests and being adequately represented in wing-collection survey.

$$\frac{A = G}{C} \quad \frac{B = H}{D} \quad \frac{G+H = J}{2} \quad \frac{J = K}{\sum J} \quad \frac{K \left(\frac{E + F}{2} \right) = L}{\sum L} \quad \frac{L = M}{\sum L}$$

Table 8.--Woodcock productivity by harvest area as indicated by the wing-collection survey, 1969-70 hunting season

State or Province of harvest	Age and Sex Categories										Total wings received*	Immatures per adult female**
	ADULT			IMMATURE				Unknown age				
	Male	Female	Unknown	Male	Female	Unknown						
Alabama	5	14	0	12	5	0	0	36	--			
Arkansas	8	14	0	10	12	0	0	44	--			
Connecticut	166	209	8	270	202	11	25	891	2.31			
Delaware	1	2	0	4	5	0	0	12	--			
Florida	2	3	0	12	13	0	1	31	--			
Georgia	12	11	0	8	9	0	0	40	--			
Illinois	2	1	0	5	4	1	2	15	--			
Indiana	34	21	1	44	23	2	2	127	3.29			
Kentucky	0	2	0	3	2	0	0	7	--			
Louisiana	102	132	2	218	211	7	10	682	3.30			
Maine	710	975	28	823	767	36	104	3443	1.67			
Maryland	16	34	0	29	41	2	3	125	2.12			
Massachusetts	237	302	4	290	242	16	8	1099	1.81			
Michigan	344	611	23	357	373	15	25	1748	1.22			
Minnesota	51	64	5	68	83	3	6	280	2.41			
Mississippi	12	16	0	7	8	1	0	44	--			
Missouri	1	1	0	4	5	0	0	11	--			
New Brunswick	31	49	1	74	57	3	7	222	2.73			
New Hampshire	236	333	10	247	245	5	8	1084	1.49			
New Jersey	349	477	6	659	625	21	53	2190	2.74			
New York	464	718	14	440	529	22	62	2249	1.38			
North Carolina	14	8	1	20	15	0	1	59	--			
Nova Scotia	2	3	0	9	6	0	0	20	--			
Ohio	97	119	4	92	81	5	8	406	1.50			
Oklahoma	1	0	0	0	0	0	0	1	--			
Ontario	0	1	0	0	1	0	0	2	--			
Pennsylvania	280	305	13	242	218	8	22	1088	1.53			
Rhode Island	8	8	0	21	19	1	0	57	--			
South Carolina	10	19	0	27	25	0	1	82	--			
Tennessee	11	8	1	7	2	0	1	30	--			
Texas	24	17	2	21	24	3	3	94	--			
Vermont	87	118	1	96	87	5	17	411	1.59			
Virginia	22	15	1	32	33	3	8	114	4.53			
West Virginia	23	24	1	17	14	1	7	87	--			
Wisconsin	190	330	14	275	286	7	2	1104	1.72			
TOTALS	3552	4964	140	4443	4272	178	386	17935	1.79			

* Excluding wings from special study areas and unknown harvest areas.

**Unweighted data from harvest areas represented by at least 100 wings.

Table 9.--Indexes of woodcock productivity as indicated by age ratios determined from wings received from cooperators who participated in both 1968-69 and 1969-70 wing-collection surveys

Area of harvest	Proportion of "total" kill (Weighting factor)	Number of wings received	Immatures			Immatures per adult female*			Change in weighted age ratios
			1968-69	1969-70	1968-69	1969-70	1968-69	1969-70	
Alabama		34	23	9	9	11	--	--	
Arkansas		14	35	2	12	5	--	--	
Connecticut**	.0250	528	625	105	137	307	2.92	2.63	
Delaware		12	10	3	1	7	--	--	
Florida		2	8	0	1	1	--	--	
Georgia		13	17	5	4	5	--	--	
Illinois		13	15	2	1	8	--	--	
Indiana		87	81	35	12	38	--	--	
Louisiana**	.0605	437	515	82	91	290	3.54	3.69	
Maine**	.1171	2545	2161	620	593	1348	2.17	1.69	
Maryland		105	74	27	23	60	--	--	
Massachusetts**	.0411	608	726	176	186	317	1.80	2.00	
Michigan**	.1508	1599	1381	488	492	765	1.57	1.20	
Minnesota**	.0103	199	247	80	56	88	1.10	2.50	
Mississippi		44	38	14	15	20	--	--	
Missouri		9	5	0	0	6	--	--	
New Brunswick		140	212	26	47	71	2.73	2.68	
New Hampshire**	.0406	1263	825	359	255	571	1.59	1.49	
New Jersey**	.0367	1656	1724	399	373	947	2.37	2.78	
New York	.1800	1673	1626	500	521	804	1.61	1.36	
North Carolina		26	48	8	6	12	--	--	
Ohio**	.0567	367	309	84	84	201	2.39	1.68	
Pennsylvania**	.1848	1170	955	367	268	485	1.32	1.51	
Rhode Island		59	42	5	8	49	--	--	
South Carolina		68	22	11	4	49	--	--	
Tennessee		14	29	3	8	4	--	--	
Texas		38	92	8	16	9	--	--	
Vermont**	.0444	500	332	133	94	268	2.02	1.73	
Virginia		24	33	3	1	17	--	--	
West Virginia		53	60	13	17	22	--	--	
Wisconsin**	.0520	916	838	287	251	414	1.44	1.67	
TOTALS AND WEIGHTED AGE RATIOS**		14216	13108	3854	3586	7199	1.85**	1.72**	-7.03%

* Computed only for harvest areas (States) represented by at least 150 wings in the 2 years.

**Weighted age ratios are the sum of the products of State age ratios multiplied by their specific weighting factors.

Table 10:--Indexes of woodcock hunting success as indicated by the number of wings received from cooperators who participated in both 1968-69 and 1969-70 wing-collection surveys (excluding nonresident hunters)

State of residence	Weighting factor	Number who cooperated both years	Number of envelopes	Number of wings		Average number of wings per envelope*	Average number of wings per cooperator*	
				1968-69	1969-70		1968-69	1969-70
Ala.		3	16	13	34	23	--	--
Ark.		3	8	22	10	34	--	--
Conn.**	.0250	72	244	280	513	618	2.1	2.2
Del.		4	10	9	12	10	--	--
Fla.		1	1	2	2	8	--	--
Ge.		6	13	12	13	17	--	--
Ill.		3	6	8	13	15	--	--
Ind.		11	36	40	87	81	2.4	2.0
La.**	.0605	25	139	162	417	506	3.0	3.1
Maine**	.1171	126	747	679	2250	1881	3.0	2.8
Md.		5	38	29	105	74	--	--
Mass.**	.0411	55	220	257	532	660	2.4	2.6
Mich.**	.1508	98	501	462	1360	1187	2.7	2.6
Minn.**	.0103	20	73	82	192	245	2.6	3.0
Miss.		5	16	17	43	35	--	--
Mo.		2	3	2	9	5	--	--
N.H.**	.0406	46	264	204	669	438	2.5	2.1
N.J.**	.0367	143	621	676	1618	1652	2.6	2.4
N.Y.**	.1800	126	554	558	1428	1406	2.6	2.5
N.C.		8	22	25	26	48	--	--
Ohio**	.0567	38	143	134	367	309	2.6	2.3
Pa.**	.1848	101	413	327	1031	787	2.5	2.4
R.I.		10	23	27	56	40	2.4	1.5
S.C.		4	7	6	15	11	--	--
Tenn.		2	3	3	3	4	--	--
Tex.		3	16	21	38	92	--	--
Vt.**	.0444	27	179	135	429	258	2.4	1.9
Va.		5	14	13	24	33	--	--
W. Va.		8	19	23	37	53	--	--
Wis.**	.0520	87	341	333	832	747	2.4	2.2
TOTALS AND WEIGHTED AVERAGES**		1047	4690	4561	12165	11277	2.6**	2.5**
							12.6**	11.2**

* Computed only for States represented by at least 10 hunters who cooperated both years.

**Weighted average is the sum of the products of State averages multiplied by their specific weighting factors using only States represented by at least 20 hunters who cooperated both years.

Table 11--Distribution of 1968-69 and 1969-70 wing collection by 10-day periods*

STATE	2-YEAR SAMPLE	OPENING DATE		PERCENT OF KILL IN PERIOD							
		1969	1970	1	2	3	4	5	6	7	8
Ala.	77	11-28	11-28	4	12	18	5	18	25	18	
Ark.	56	11-28	11-28	--	5	21	27	11	21	14	
Conn.	1506	10-19	10-18	10	51	27	8	4	T	--	T
Del.	33	11-22	11-22	70	15	6	6	3	--	--	
Fla.	47	11-9	11-15	--	6	9	6	17	36	17	9
Ga.	90	11-28	11-20	2	11	24	18	11	18	11	4
Ill.	27	10-1	10-1	--	--	--	26	67	7	--	
Ind.	234	9-28	9-20	3	12	15	25	22	15	7	1
Ky.	9	11-21	11-20	22	67	11	--	--	--	--	--
La.	1141	11-28	11-27	5	11	14	25	23	12	10	
Maine	6562	9-24	9-24	13	23	31	31	2	T		
Md.	250	10-16	10-10	--	9	19	28	17	11	8	7
Mass.	1763	10-10	10-10	7	34	39	14	5	1		
Mich.	3738	9-15	9-15	10	15	23	26	21	4	T	
Minn.	494	9-7	9-6	6	9	15	17	30	21	2	
Miss.	113	11-30	11-28	5	15	13	18	29	12	8	
Mo.	23	10-1	10-1	4	22	--	17	30	22	4	
N.H.	2477	10-1	10-1	31	33	25	11	1	--		
N.J.	4363	10-5	10-4	11	11	27	25	13	10	3	
N.Y.	4284	9-23	9-22	3	17	33	31	12	3	T	
N.C.	120	11-16	11-28	5	15	18	20	21	15	5	2
Ohio	881	9-20	9-19	7	14	17	21	19	16	6	T
Okla.	1	--	11-2	--	--	100	--	--	--	--	
Pa.	2459	10-12	10-18	29	41	21	6	3	--	--	
R.I.	168	10-26	10-25	38	45	7	10	1	--	--	
S.C.	200	11-28	11-28	9	8	25	15	13	12	18	
Tenn.	60	11-18	11-17	47	40	3	5	--	5	--	
Tex.	133	11-23	11-22	5	11	20	5	12	23	23	
Vt.	1058	9-28	9-27	13	26	36	22	3	T	--	--
Va.	155	11-18	11-17	14	34	18	17	3	1	13	--
W.Va.	155	9-21	9-20	3	Closed	18	28	28	16	6	--
Wis.	2168	9-14	9-13	5	15	19	36	20	5	T	

* Each month divided into three 10-day periods except that third period has 11 days in 31-day months. For each State, period 1 is that period in which the earlier of the two opening dates occurred.

-- = season open but no wings contributed

T = Trace (less than 0.5 percent)

Table 12--Summary of sex and age ratios in woodcock wing collection by periods - Central Region

PERIOD	Sample Size*	Percent of Season Sample	Adult Females		Immature Females		Immatures	
			100 Adult Males	100 Immature Males	100 Immature Females	100 Adult Females		
NORTH CENTRAL								
I (to Sept. 30)	1968-69	21.4	183		80		166	
	1969-70	26.1	128		92		199	
II (Oct. 1-20)	1968-69	47.0	176		108		144	
	1969-70	55.4	195		115		143	
III (after Oct. 20)	1968-69	31.6	153		93		137	
	1969-70	18.6	185		102		99	
MID-CENTRAL								
I (to Oct. 10)	1958-69	33.3	149		82		240	
	1969-70	31.1	107		113		184	
II (Oct. 11 to Nov. 10)	1968-69	55.6	181		101		182	
	1969-70	50.5	135		68		155	
III (after Nov. 10)	1968-69	11.1	83		61		253	
	1969-70	18.5	59		45		263	
SOUTH CENTRAL								
I (to Dec. 10)	1968-69	19.0	156		61		279	
	1969-70	15.1	141		81		232	
II (Dec. 11 to Jan. 10)	1968-69	55.8	138		112		284	
	1969-70	59.5	118		109		319	
III (after Jan. 10)	1968-69	25.2	150		118		177	
	1969-70	25.4	163		77		244	

* Excluding adult unknowns and unknown sex and age.

Table 13--Summary of sex and age ratios in woodcock wing collection by periods - Atlantic Region

PERIOD	Sample Size*	Percent of Season Sample	Adult Females				Immature Females				Immatures	
			100 Adult Males		100 Adult Females		100 Immature Males		100 Immature Females		100 Adult Males	100 Adult Females
NORTH ATLANTIC												
I (to Oct. 10)	1968-69	2424	27.4	137	100	187						
	1969-70	1938	23.0	156	107	146						
II (Oct. 11-31)	1968-69	5405	61.1	143	97	182						
	1969-70	5359	63.6	144	94	165						
III (after Oct. 31)	1968-69	1015	11.5	128	81	230						
	1969-70	1129	13.4	96	87	211						
MID-ATLANTIC												
I (to Oct. 20)	1968-69	854	22.4	162	76	140						
	1969-70	794	23.6	155	107	181						
II (Oct. 21 to Nov. 20)	1968-69	2568	67.5	145	99	194						
	1969-70	2114	62.9	119	96	209						
III (after Nov. 20)	1968-69	383	10.1	96	73	686						
	1969-70	455	13.5	80	79	667						
SOUTH ATLANTIC												
I (to Dec. 10)	1968-69	74	29.6	95	88	165						
	1969-70	50	24.9	144	87	215						
II (Dec. 11 to Jan. 10)	1968-69	131	52.4	161	78	192						
	1969-70	109	54.2	122	103	314						
III (after Jan. 10)	1968-69	45	18.0	160	138	388						
	1969-70	42	20.9	60	73	433						

* Excluding adult unknowns and unknown sex and age.

Table 14--Summary of sex and age ratios in woodcock wing collection by periods in selected States in Central Region

PERIOD		Sample Size*	Percent of Season Sample	Percent of		
				Adult Females 100 Adult Males	Immature Females 100 Immature Males	Immatures 100 Adult Females
WISCONSIN						
I (to Sept. 30)	1968-69	209	19.3	206	85	134
	1969-70	216	20.9	153	79	227
II (Oct. 1-20)	1968-69	561	51.8	161	113	144
	1969-70	588	57.0	174	113	171
III (after Oct. 20)	1968-69	313	28.9	116	72	140
	1969-70	228	22.1	190	122	140
MICHIGAN						
I (to Sept. 30)	1968-69	437	22.3	166	81	187
	1969-70	456	27.9	134	91	166
II (Oct. 1-20)	1968-69	868	44.2	171	105	149
	1969-70	915	55.9	210	118	123
III (after Oct. 20)	1968-69	658	33.5	172	106	138
	1969-70	266	16.2	184	72	62
OHIO						
I (to Oct. 10)	1968-69	167	37.0	148	70	250
	1969-70	140	36.6	108	130	158
II (Oct. 11-31)	1968-69	182	40.4	161	145	242
	1969-70	155	40.6	167	57	122
III (after Oct. 31)	1968-69	102	22.6	163	48	168
	1969-70	87	22.8	88	95	182
LOUISIANA						
I (to Dec. 10)	1968-69	94	19.4	160	68	425
	1969-70	90	14.0	119	73	289
II (Dec. 11 to Jan. 10)	1968-69	290	59.8	161	123	338
	1969-70	397	61.9	113	103	377
III (after Jan. 10)	1968-69	101	20.8	192	110	252
	1969-70	154	24.0	240	88	258

* Excluding adult unknowns and unknown sex and age.

Table 15--Summary of sex and age ratios in woodcock wing collection by periods in selected States in Atlantic Region

PERIOD	Sample Size*	Percent of Season Sample	Adult Females		Immature Females		Immatures	
			100 Adult Males	100 Adult Females	100 Immature Males	100 Adult Females		
MAINE								
I (to Oct. 10)	1968-69	1243	37.9	137	98		198	
	1969-70	1013	33.3	169	96		142	
II (Oct. 11-31)	1968-69	1981	60.4	131	110		208	
	1969-70	1941	63.8	125	95		180	
III (after Oct. 31)	1968-69	55	1.7	170	93		165	
	1969-70	86	2.8	100	105		191	
NEW YORK								
I (to Oct. 10)	1968-69	389	19.0	172	92		169	
	1969-70	436	20.9	142	146		143	
II (Oct. 11-31)	1968-69	1370	66.9	179	87		138	
	1969-70	1288	61.7	176	108		141	
III (after Oct. 31)	1968-69	289	14.1	116	82		245	
	1969-70	364	17.4	112	153		127	
PENNSYLVANIA								
I (to Oct. 20)	1968-69	422	31.0	155	71		105	
	1969-70	252	25.0	135	76		122	
II (Oct. 21 - Nov. 10)	1968-69	850	62.5	143	97		133	
	1969-70	627	62.3	97	97		157	
III (after Nov. 10)	1968-69	87	6.4	94	56		338	
	1969-70	128	12.7	132	89		212	
NEW JERSEY								
I (to Oct. 20)	1968-69	410	18.6	166	77		179	
	1969-70	517	25.3	161	119		224	
II (Oct. 21 - Nov. 10)	1968-69	1213	55.2	165	105		196	
	1969-70	1001	49.0	143	95		212	
III (after Nov. 10)	1968-69	576	26.2	96	90		630	
	1969-70	526	25.7	77	79		727	

* Excluding adult unknowns and unknown sex and age.

Table 16.-Distribution of harvest by 10-day periods in Central Region

STATE & YEAR	SEASON OPENED	SAMPLE SIZE	PERIOD*															MEDIAN PERIOD OF HARVEST
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			Percent of sample collected during period (dashes indicate season open but no wings collected)															
MINN.	9/7	242	6.2	5.8	13.2	20.7	26.9	24.8	2.5									10/11-20
	69-70	252	6.3	12.3	16.3	13.1	32.9	17.9	1.2									10/11-20
WIS.	9/14	1120		2.3	17.0	18.9	33.2	24.4	4.2									10/11-20
	69-70	1048		8.1	13.2	18.7	38.1	15.6	5.5	0.8								10/11-20
MICH.	9/15**	2054		9.3	14.3	19.9	23.9	28.4	4.0	0.1								10/11-20
	69-70	1684		11.8	16.4	27.1	28.7	11.7	3.8	0.5								10/1-10
ILL.	68-69	13				--	--	--	30.8	53.8	15.4	--						11/11-20
	69-70	14				--	--	--	21.4	78.6	--	--						11/11-20
IND.	68-69	120			10.0	24.2	35.0	20.8	5.8	3.3	0.8	--						10/11-20
	69-70	114		7.0	13.2	6.1	14.9	22.8	24.6	10.5	0.9							10/21-31
OHIO	9/20	487		3.5	13.3	20.7	19.9	20.7	18.3	3.1	0.4							10/11-20
	69-70	394		11.2	13.7	12.7	22.8	17.3	12.2	10.2	--							10/11-20
MO.	68-69	12			--	--	41.7	--	25.0	33.3	--	--						11/1-10
	69-70	11				9.1	--	--	9.1	27.3	45.5	9.1						11/21-30
KY.	68-69	2								28.6	100.0	--	--	--	--	--	--	11/21-30
	69-70	7								57.1	57.1	14.3	--	--	--	--	--	11/21-30
ARK.	68-69	16								--	--	18.8	6.3	56.3	6.3	12.5		12/21-31
	69-70	40								--	--	--	27.5	15.0	12.5	25.0	20.0	1/1-10
TENN.	68-69	37								45.9	48.6	2.7	--	--	--	2.7	--	11/21-30
	69-70	24								45.8	25.0	4.2	12.5	--	--	8.3	4.2	11/21-30
TEX.	68-69	39								5.1	2.6	20.5	5.1	5.1	2.6	10.3	53.8	1/21-31
	69-70	94								5.3	14.9	19.1	5.3	5.3	16.0	28.7	10.6	1/1-10
LA.	68-69	500								5.4	13.6	15.0	28.0	28.0	16.8	12.6	8.6	12/21-31
	69-70	641								5.3	8.9	13.1	22.2	22.2	27.6	11.7	11.2	1/1-10
MISS.	68-69	83								7.2	16.9	14.5	6.0	33.7	33.7	10.8	10.8	1/1-10
	69-70	30								--	10.0	10.0	50.0	50.0	16.7	13.3	--	12/21-31
ALA.	68-69	42								--	9.5	19.0	--	--	16.7	26.2	28.6	1/11-20
	69-70	35								8.6	14.3	17.1	11.4	20.0	22.9	5.7	5.7	12/21-31

* Eleven days in last period of 31-day months.

** Later opening in Zone 3 (approximately southern one-third of State).

Table 12--Distribution of harvest by 10-day periods in Atlantic Region

STATE & YEAR	SEASON OPENED	SAMPLE SIZE	PERIOD*															MEDIAN PERIOD OF HARVEST
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
			Percent of sample collected during period (dashes indicate season open but no wings collected)															
MAINE	68-69	9/24	3495	13.3	24.8	28.7	31.4	1.7	0.1									10/11-20
	69-70	9/24	3167	12.8	20.5	33.2	30.8	2.0	0.8									10/11-20
N.Y.	68-69	9/23**	2123	3.4	16.0	32.9	33.8	12.5	1.3	0.2								10/11-20
	69-70	9/22**	2161	3.3	17.8	32.9	28.8	11.6	5.2	0.5								10/11-20
VT.	68-69	9/28	663	14.2	26.1	29.4	25.9	3.9	0.5	--								10/11-20
	69-70	9/27	395	9.9	26.8	46.3	14.9	1.8	0.3	--								10/11-20
N.H.	68-69	10/1	1451	32.9	28.4	26.2	12.3	0.1	--									10/11-20
	69-70	10/1	1026	28.2	38.5	22.3	9.8	1.2	--									10/11-20
MASS.	68-69	10/10	730	7.9	30.4	42.6	16.8	1.6	0.5									10/21-31
	69-70	10/10	1033	6.1	36.6	36.4	11.5	8.1	1.3									10/21-31
CONN.	68-69	10/19	647		7.4	50.7	32.1	4.5	4.6	0.5	--	0.2						10/21-31
	69-70	10/18	859		11.2	51.2	23.6	10.8	2.7	0.5	--							10/21-31
R.I.	68-69	10/26	112			39.3	47.3	4.5	8.9	--	--							11/1-10
	69-70	10/25	56			35.7	39.3	10.7	12.5	1.2	--	--						11/1-10
PA.	68-69	10/12	1419		31.2	39.7	22.4	4.3	2.3	--	--							10/21-31
	69-70	10/18	1040		25.5	42.9	19.1	9.4	3.1	--	--							10/21-31
N.J.	68-69	10/5	2261	10.3	8.5	25.5	29.6	13.5	10.5	2.0								11/1-10
	69-70	10/4	2102	10.8	14.1	29.1	20.6	11.8	9.4	4.0								10/21-31
W.VA.	68-69	10/12***	71		16.9	28.2	32.4	8.5	14.1	--	--							11/1-10
	69-70	10/11***	80		20.0	30.0	26.3	23.8	--	--	--							10/21-11/10
MD.	68-69	10/16	128		10.2	16.4	31.3	19.5	9.4	0.8	12.5							11/1-10
	69-70	10/10	122		7.4	22.1	24.6	14.8	12.3	16.4	2.5							11/1-10
DEL.	68-69	11/22	22															11/21-30
	69-70	11/21	11															11/21-30
VA.	68-69	11/18	42															11/21-30
	69-70	11/17	113															12/1-10
N.C.	68-69	11/16	66															12/11-20
	69-70	11/28	55															12/21-31
S.C.	68-69	11/28	119															12/11-20
	69-70	11/28	81															12/21-31
GA.	68-69	11/28	50															12/11-20
	69-70	11/20	40															12/11-20
FLA.	68-69	11/9	18															12/21-31
	69-70	11/15	29															12/21-31

* Eleven days in last period of 31-day months.

** Later opening in southern part of State including Long Island.

*** Except for special 8-day early season in late September.

Table 18.--Summary of woodcock harvest by potential waterfowl hunters who purchased Migratory Bird Hunting Stamps with the intention of hunting waterfowl

Sub-Region	2-Year Average				1st to 3rd Period	
	1964-65 & 1965-66		1966-67 & 1967-68		Percent Change	
	Hunters	Harvest	Hunters	Harvest	Hunters	Harvest
Potential						
Waterfowl Hunters*	1,000,834		1,209,336		+17	
North Central	41,519	140,622	38,756	123,826	- 1	-30
Mid-Central	8,779	27,594	8,527	23,838	+31	+34
South Central	12,861	70,256	16,942	81,865	+46	+68
Regional Totals	63,159	238,472	64,225	229,529	+13	+ 6
North Atlantic	30,554	120,254	37,253	144,427	+63	+55
Mid-Atlantic	16,208	45,940	19,704	59,699	+73	+93
South Atlantic	4,456	18,194	5,546	20,339	+61	+54
Regional Totals	51,218	184,388	62,503	224,465	+66	+64
Northern Zone	72,073	260,876	76,009	268,253	+26	+ 9
Mid-Zone	24,987	73,534	28,231	83,537	+59	+71
Southern Zone	17,317	88,453	22,488	102,204	+50	+65
Combined U.S.	114,377	422,860	126,728	453,994	+37	+32

** Excluding stamp sales in States outside the woodcock wing-collection area.

Table 19.--Bureau-funded woodcock research in progress in FY 1970 in the United States*

Organization	Activity	Annual Allotment	Duration (Years)	Scheduled Expiration (Fiscal Year)
Bureau of Sport Fisheries and Wildlife				
MBPS - Orono Station	Habitat, banding, and behavioral studies**	\$25,000	Long term	Indefinite
Moosehorn Refuge	Banding and habitat studies	5,000	Long term	Indefinite
Indiana	Breeding ground banding**	4,200	3	1971
Maine	Breeding ground banding**	5,250	5	1972
	Behavioral studies (telemetry)	2,667	3	1971
Massachusetts	Development of random singing-ground survey and breeding ground banding**	2,400	2	1971
Minnesota	Habitat studies**	2,400	2	1972
	Behavioral studies (telemetry)**	14,000	3	1972
New Hampshire	Development of random singing-ground survey**	1,750	2	1970
New York	Breeding ground banding**	5,250	5	1972
Ohio	Development of random singing-ground survey**	2,400	2	1971
Pennsylvania	Breeding ground banding**	5,250	5	1972
Vermont	Development of random singing-ground survey**	1,750	2	1970
West Virginia	Breeding ground banding**	5,250	5	1972
Wisconsin	Breeding ground banding**	5,250	5	1972

* In addition the following Provinces and States are supporting projects under one or more of the activities listed, from their own resources and/or (in the States) Federal Aid Funds: Connecticut, Massachusetts, Michigan, New Brunswick, Nova Scotia, Ontario, Prince Edward Island, Virginia, and West Virginia.

** Funds made available through the Accelerated Research Program for Shore and Upland Migratory Game Birds.

Table 20.--Woodcock banding by States, 1960-69 (excluding experimental birds)

LOCATION	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	10-YR TOTAL
ATLANTIC REG.											
Conn.					1				1	2	4
Fla.			1							4	5
Ga.										4	6
Maine	29	35	367	515	457	301	471	549	732	828	4,284
Md.	4	4	6	22	12	16	13	7	5	2	91
Mass.	30	1	5	1	5	1	8	121		4	176
N.B.					17	5				261	283
N.H.								4	5		9
N.J.	9	9	6	13	12	7	13	4	645	345	1,063
N.Y.	8	8	9	15	20	9	19	8	14	485	595
N.C.		1	1						3		5
N.S.					34				1		35
Pa.	10	19	45	51	9	6	9	5	36	38	228
P.E.I.		1					1				2
R.I.		2		2			6	2	7	9	26
S.C.		2		1		1	1	1		1	7
Va.	1	1	1						3	7	13
W.Va.	2	3		8	16	103	301	434	516	249	1,632
REGION TOTAL	93	84	441	628	584	449	843	1,135	1,968	2,239	8,464
CENTRAL REG.											
Ala.	1				2	2			2	2	9
Ill.		1		2		1	2	2	3	4	15
Ind.	1		1	1	5	8				76	92
Iowa			2	3	1	5	3	2			16
La.	363		748	292	2,549	815	1,230	900	1,076	472	8,445
Mich.	4	51	50	124	79	355	365	396	868	403	2,695
Minn.	6		1	13	4	3		17	79	111	234
Miss.										68	69
Ohio	1		1	6	8		6	6	1	3	31
Okla.				1							1
Ont.	4	6	12	10	20	41	14	22	19	26	174
Tenn.		1		1	1	1		1	3		8
Tex.										1	1
Wis.	5	8	9	19	31	20	27	22	281	185	607
REGION TOTAL	385	67	824	472	2,700	1,251	1,647	1,368	2,332	1,351	12,397
COMB. TOTALS	478	151	1,265	1,100	3,284	1,700	2,490	2,503	4,300	3,590	20,861

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